The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154, FLEET STREET, LONDON, E.C.4

Telegrams : ALLANGAS FLEET LONDON
Telephone : CENTRAL 3212 (10 lines)
GLASGOW : 116, Hope Street (Central 3970)
BIRMINGHAM : Daimler House, Paradise Street (Midland 0784-5)
THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

VOL. XLIII. NO. 1121 December 21, 1940 Annual Subscription, 21s. Overseas, 26s.

Strategic Minerals in North America

WE hear much these days of "total war"—the utilisation of all a country's forces for the prosecution of the struggle. But it is sometimes difficult to realise how complete are the requirements of a modern war. Paul M. Tyler, of the United States Bureau of Mines, writing in a recent issue of the *Harvard Business Review*, points out that "virtually all of the 92 chemical elements distinguished by chemists are used in industry—all but a few that are too rare in nature or too difficult to isolate—and virtually the same list is employed in war as in peace. All metals and minerals used in products for the military establishments and even those requisite to maintenance of the civilian population when a nation is at war have strategic importance."

Considered as an economic unit, the North American continent is unusually fortunate in regard to these strategic materials, and its resources of the important minerals necessary to industrial and military activity are reviewed in a bulletin issued by the Royal Bank of Canada. Many of these strategic materials are available in North America in quantities more than sufficient for its requirements; the latest list of such materials to be procured from outside sources by the United States contained only 14 items, including rubber and nine minerals, namely, antimony, chromium, manganese, mercury, mica, nickel, quartz crystals, tin, and tungsten. Nickel, which is one of the most essential war metals, is lacking in the United States, but as Canada produces such a large proportion of the world output the Canadian supply is adequate for any probable demand.

A few of the mineral products are lacking in North America or Canada can be secured in South America. Quartz crystals, for example, are obtained in Brazil. The greatest demand for these would be unlikely to exceed 50 tons a year, yet without this comparatively small amount, wireless communication, for example, would become well nigh impossible. Bolivia and Mexico have expanded their output of antimony sufficiently in the past five years to offset the decline in Chinese production. In Canada, the Consolidated Mining and Smelting Company has completed a plant for the production of refined antimony from smelter flue dust. This plant has a daily capacity of four tons while Canada's normal requirements of antimony are less than 500 tons per annum.

This summer, Canada became a substantial producer of mercury, one of the most vital strategic materials, formerly secured from Spain and Italy. A monthly output of some 400 76-lb. standard flasks is being obtained from northern British Columbia; this is reported to be supplying not only Canadian needs but a large part of British requirements as well.

It is when we turn to the other strategic materials in the United States list that we appreciate fully the importance of the Far Eastern situation and particularly the position of South-East Asia. Besides being the most important source of antimony, China produces almost half the world's chromium, with Burma providing an additional 15 per cent. Russia's output of manganese ores in 1937 was 2,700,000 metric tons of a world total of 6,000,000 tons and British India's production was in excess of 1,000,000 tons. British India is practically the only source of sheet mica. The two outstanding products of Asia which appear in the list of essential materials, however, are rubber and tin. Crude rubber is the most important single commodity imported into the United States, purchases being valued at $178,000,000 in 1939. Almost 99 per cent. of the world's crude rubber is produced in south-east Asia—53 per cent. in Malaya, Burma and other British possessions and 39 per cent. in the Netherlands East Indies. Should access to these sources become impossible or shipments seriously delayed, the United States alone would have to find approximately 600,000 tons of crude rubber annually. Reclaimed rubber can be extensively used, but requires mixing with fresh crude rubber. It is estimated that the available equipment in the United States, operated at capacity, could produce between 125,000 and 150,000 tons of reclaimed rubber annually, about a quarter of the requirement. The total capacity of synthetic rubber production at the end of 1940 is expected to reach only 10,000 tons.

Seventy-five per cent. of the world's tin comes from the same corner of Asia as the rubber. There is, however, a substantial output of low-grade tin in Bolivia, which could provide somewhat less than half the United States annual requirements. The provision of smelters is under serious consideration in the United States for the treatment of these ores.

The Canadian list of products not wholly procurable from domestic sources is more extensive than that of the United States, comprising some thirty items of greater or less importance. They include, in addition to those already mentioned, cryolite, fluorspar, certain iron ores, magnesium, molybdenum, petroleum, phosphates, elemental sulphur, and vanadium, for though deposits of most of these minerals exist in Canada, production is mainly in the form of by-products and volume has been largely dependent upon the demand for the major metals.

NOTES AND COMMENTS

The War Damage Bill

SECOND thoughts on the War Damage Bill are in the main favourable. It is an enormous gain that every citizen with something to lose has been given a greater feeling of security against the blind chances of war. The principle, underlying the Bill, of mutual assistance in an unexampled emergency, meets with full approval from the business community. Even the detailed provisions of the measure, which will be freely criticised and undoubtedly amended in its passage through Parliament, will not stir the feeling that would have been aroused if this had been a normal Bill presented in normal times. For one thing, the critics must rid their minds from the beginning of the idea that they are discussing an insurance scheme to which the well-known actuarial rules should apply. This is not an insurance scheme in the real meaning of the word; it is a national compensation scheme. When once that distinction has been grasped, much of the perplexity felt on a first reading of the Bill disappears. That is not to say that the collection of premiums or payments to finance the scheme will not be exceedingly onerous. Every owner of property is faced with an early demand for an addition of 2s. in the £ on his Schedule A assessment. Compulsory likewise is the insurance of all moveable assets of business undertakings, such as plant and machinery and office and shop equipment, at the rate of 30s. per cent. These are severe burdens, and there will be many hard cases in which it may be hoped they can be eased. Still, nobody has suggested any fairer method of coping with the colossal problem of war damage than a compulsory national scheme equipped with the machinery to provide a pool of many millions by which the fortunate may relieve the unfortunate. The Bill is a tribute to our individual humanity no less than to our financial strength. If the raising of an additional sum of £80,000,000 in two years attests the Chancellor of the Exchequer's confidence in the resilience of the finance of British business, it is also the most splendid indication the nation has so far given of the new war-time principle of helping one another.

Some Chemical Accidents

IN accordance with our regular practice of some months' standing, we are including this month, as usual, an article on safety measures in chemical works. Some record of what has actually happened when these precautions are neglected does not come amiss, on occasion, and we therefore make no apology for printing, with italics as our comment, an account of three accidents reported from an overseas source. (1). A man working on a connection of a tank-car dome missed his footing and lost sixteen days' working time. *There was no railing* on the tank-car. (2). Two men were killed by hydrogen sulphide—one while attempting to rescue the other. One man was cleaning a fan in a series of four units, while three other fans were working, and an exhaust-fan blowing off fumes. The chamber was first tested by mice. *The job was interrupted*, and the man returned and was fatally gassed. The belt had come off the exhaust-fan and *there was a slight leak* in the valve on the exhaust-duct. No precaution is as reliable as disconnection. *It is not enough to close a valve at times; it should also be locked.* A man working in a confined place should be supplied with fresh air, mechanically injected, and his withdrawal should not depend on anyone entering the chamber when he is working. Mice, incidentally, are not good indicators, except for carbon monoxide and hydrogen cyanide. (3). Pouring nitric acid into a container which had *some unknown material* in it caused an explosion with burns to four people.

The Salvage of Waste

THE first of a series of joint meetings of the Chemical Engineering Group of the Society of Chemical Industry and the Institution of Chemical Engineers, which, as reported, was held recently in London, was an entire success. The object of holding joint meetings is the admirable one of preventing the two organisations dissipating their energies in arranging separate programmes at a time when no meeting is arranged without difficulty and with a considerable factor of uncertainty. As was pointed out by Mr. H. W. Cremer, chairman of the Group, the two organisations have much in common. The size of the attendance must have been very gratifying to the organisers and such was the enthusiasm of Mr. F. Heron Rogers, president of the Institution, that he expressed the hope that the joint meetings would continue, war or no war. The subject under discussion was the provocative one of "The Salvage of Waste Materials in the Chemical Industry." Several of the speakers inclined to the view that salvage in itself presented no problems that could not be solved with relative ease, but that the dominant question was one of economics. There can be no disputing the need for salvaging waste—as well as preventing it—and it seems to us that the question is one that is best left to the individual consciences of those in the industry.

Alginic Acid

FURTHER information concerning the use of alginic acid as a raw material for rayon production, resulting from the researches at Leeds by Dr. J. B. Speakman and his colleagues, is contained in an article published in the December issue of *Silk and Rayon*. It is pointed out there that the peculiar structure of the alginic acid molecule, which closely resembles the cellulose molecule, is sufficient to account for its usefulness in textile manufacture, provided that the complexity of its molecules is adequately great. Recent researches reveal that alginic acid consists, structurally, of long chains of six-atom rings connected by oxygen atoms, each six-atom ring containing five atoms of carbon and one of oxygen. As for its complexity, Speakman has stated that the acid can be obtained in graded forms with molecular weight from 48,000 to 185,000, between which limits is a complexity quite sufficient for rayon manufacture. It has already been pointed out in our pages that the main drawback to the original filaments spun from alginic acid was that they were soluble in alkalies, and it was essential to find one of the alginic salts that would be unaffected by the usual alkali treatments applied to textile fibres. Chromium and aluminium alginates are resistant to soap liquors, but might be inclined to present difficulties when it came to wet-processing goods incorporating these salts, especially when acid liquors were used. Beryllium alginate, however, was found to have excellent stability to hot alkaline liquors, and is indicated by Speakman as the most satisfactory alginic salt so far discovered for the purpose of textile manufacture. There is still room for further research, however, and the writer of the article suggests that still further stability may be found in an organic, rather than a metallic, replacement of the carboxyl group, the decomposition of which constitutes the principal weakness of the alginic acid molecule.

Bleaching Earth—Natural and Activated

Its Production, Application and Qualities

by FREDERIC NEURATH, Ph.D.

THE use of certain earths for the bleaching of oils, fats and waxes of various kinds was first discovered by Englishmen; they also exploited the large deposits of bleaching earth and fullers' earth round London, near Reigate (Surrey) and Maidstone (Kent). The original application of the material, however, was not for oil and fat decolorisation but —as the name implies—for the fulling of textile materials with the aim of cleansing them from fat and grease. English fullers' earth was the most suitable material for this purpose as it gave a very good suspension with water. Soon, however, it found another still more important application in Europe and America, namely, for the refining and bleaching of vegetable, animal, and mineral oils and fats, a process formerly carried out with the residues of potassium ferrocyanide and with bone black. It was soon discovered that fullers' earth was cheaper and more effective, as much less of the oil was lost in the bleaching process. Up to about 1800 English fullers' earth dominated both the European and the overseas markets, but soon afterwards bleaching earths of equivalent qualities were found in Florida, Illinois and Massachusetts, so that the United States became more or less independent of imports. Moreover in California, Nevada, Utah and other western states the so-called "Death Valley Clay" was discovered which, activated with sulphuric acid, made a good substitute for fullers' earth.

Development of German Clays

The greatest competitor, however, arose at the beginning of the present century in the shape of the Bavarian bleaching-earth industry. In 1907 the Pfirsching Mineral Works discovered the increase of the bleaching capacity of the local clays through activation with hydrochloric acid and called their product "Frankonit"; the Moosburg Clay Works brought a similar product named "Tonsil" on to the market; and many more Bavarian works followed with other standard brands, all produced by activating special pure clays with hydrochloric acid. The new industry soon developed and made Germany an exporter of these "Bleicherden." The Bavarian clay deposits are situated on both sides of the Isar, mostly around Moosburg, Mainburg, Landshut, and Landau.

The chemical constitution of fullers' earth and of the other raw products is similar to that of other clays, consisting of a hydrated aluminium silicate with various admixtures of Fe_2O_3, CaO, MgO and H_2O. The average composition of suitable raw materials is: loss on ignition 7 per cent., SiO_2 60 per cent., Al_2O_3 20 per cent., Fe_2O_3 7 per cent., MgO 3 per cent. and CaO 3 per cent. The composition of bleaching clays from various deposits shows a wide variation in the contents of silica, alumina, and other constituents, as the following table illustrates:—

Source of Earth	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	CaO %	MgO %	Alkali %	H_2O or %	Loss on Ignition
England	44.00	23.06	2.00	4.08	2.00	—	24.95	—
,,	52.81	6.92	3.78	7.40	2.27	1.74	14.27	—
Canada	51.6	24.2	tr.	0.5	0.3	—	—	23.6
Japan	70.09	15.76	2.86	1.82	2.38	0.55	—	5.75
Russia	56.56	27.47	2.13	1.09	0.80	—	0.17	7.15
,,	34.10	38.34	2.40	1.17	0.64	3.88	—	19.47
Arkansas	64.38	17.20	8.27	1.91	1.91	1.83	6.95	—
Florida	39.66	30.00	3.46	0.87	0.70	0.45	13.11	—
,,	62.27	11.76	7.43	1.89	3.59	—	10.00	—
Georgia	72.00	10.76	2.65	3.34	4.36	—	6.00	—
South Dakota	60.16	10.38	14.87	4.06	1.71	—	7.20	—

With acknowledgments to the O.R.F. Bulletin

Fluctuations in SiO_2 are attributable to impurities due to larger or smaller quartz particles. The loss on ignition is due to the presence of organic substances and of lime. If the CO_2 escaping at a temperature of 950° C. is deducted, the ignition loss is fairly constant.

The test of a clay to find its availability for the manufacture of bleaching earth starts generally by drying the clay and reducing it to small pieces. Bleaching experiments are then carried out with this material in comparison with a good fullers' earth. It should be noted that, besides good bleaching results, the product must also give a good filtrate and must not keep too much oil back; nor must it impart an unpleasant taste to salad oils and other oils or fats for human consumption.

Test Experiments

The Bavarian raw earths vary in colour, but this is a matter of no consequence. Even the specialist cannot judge from the appearance whether any given material is suitable and he must make experiments with it on a fairly large scale, comparing the end product with good commercial brands of known quality. The finely-grained clay, ground to 2500 mesh per sq. cm., is dried at 110° C. until constancy of weight is attained and then 5 gm. are heated in a crucible to 500° C., at which temperature the $CaCO_3$ is not yet decomposed, whereas clays suitable for the preparation of bleaching earth lose most of their humidity below 400° C. Another typical characteristic is the solubility in 1/2 N hydrochloric acid. Boiled for three hours, the suitable clays lose 16 to 18 per cent. $Fe_2O_3 + Al_2O_3$ of their total content of these impurities.

English fullers' earth must first be treated with water, whereby the fines and slime are separated from the coarser particles and from sand and small stones. The fine clay deposits as sediment or is passed through filter-presses and then dried, and finally it becomes plastic enough to be ground. The German earth is either dried before loading at the pits or directly worked off. English and American earths simply require drying, grinding, and sifting; the lumpy raw earth is reduced to small pieces in a rolling mill and then is passed to the drying drums. Speed and quantity of delivery are so apportioned that the material is dry enough for the mill. The German processes involve the necessity of improving the bleaching strength of the material by means of chemical agents. The method usually practised is by treatment with acids, generally hydrochloric acid, and many patents deal with this process. The most successful patent was that of the Pfirsching Mineral Works, Kitzingen a/Main (G.P. 339,919) described as "Process for the increase of the decolorisation strength of silicates for fats, oils, wax, paraffin, etc., through decomposing treatment, especially with sufficiently strong hydrochloric acid, which is converted entirely or partially into silicic acid hydrate."

The essential requirements for the manufacture of bleaching earth by the German process are the suitable raw material

and a sufficiency of hydrochloric acid. The process from a chemical point of view is then simply as follows: having ascertained by experiment what concentration of hydrochloric acid allows the best activation for a favourable bleaching process, the wet raw material—if necessary after separation of the coarser particles by water—is stirred with water in large vats, usually concreted, until a thick slime is formed; then hydrochloric acid is added until the ideal concentration is reached. After some hours' boiling the activation is finished and the mass passes through filter-presses. The filter-cakes in the presses contain a certain amount of acid, which has to be extracted in a prolonged washing process, a most important step in the manufacture. The filter-cakes are then dried in drums or kilns until they contain only a small percentage of water. The dry material next proceeds to the mill and is finally packed in sacks of 50 or 100 kg. The filtrate containing chlorides of iron, aluminium and calcium is run to waste as no lucrative method has yet been found for using it.

The continental monopoly of the Bavarian works, due to the presence of good clay, has now lapsed, as latterly suitable clays have been found in other localities, and these are now used in chemical works where the use of by-product hydrochloric acid is desirable. The Skoda-Wetzler Works at Moosbierbaum (Austria), for example, and the Phœnix Works at Bajamare (Rumania) have taken up this industry on a large scale, likewise certain works in Russia, as an adjunct to her large petroleum industry. Many patents also deal with the regeneration of used bleaching powder (*see* Eckart and Wirzmüller: *Die Bleicherde*).

The testing of bleaching earth consists in the determination of the specific gravity with a special pycnometer. It varies for fullers' earth from 2.3 to 2.6, for chemically treated earth from 1.8 to 2.3. The most important test is to find out the bleaching strength, which can be done only by experiments on unbleached oils and in comparison with standard brands of bleaching earth, employing mineral oils for tests with mineral oils, and using soya, linseed or rape-seed oil, but not sesame oil, for tests with vegetable oils. Determination of acidity of the bleaching earth is also essential, as the lower it is the more suitable the material is for use in edible oil refining. Grinding methods vary according to requirements. Natural earth and fullers' earth are obtainable on the market in various degrees of granulation, while chemically treated earths are always pulverised. Equally various are the uses of bleaching materials. In America the local product is used only for petroleum refining, English fullers' earth being still preferred for food oils and fats. In Germany, too, imported fullers' earth was customarily used for easily bleaching oils.

Duration of bleaching for vegetable and animal oils and fats is about 15 minutes and the most suitable temperature is 80° C.; the amount of bleaching earth necessary varies from 1 to 5 per cent. For petroleum and other mineral oils the best temperature is 30° C. for 15 minutes' duration and in the proportion of 1 to 3 per cent.

MEETING THE CAFFEINE SHORTAGE

Coffee and Cocoa as Raw Materials

THE occupation of the Netherlands by German forces in the spring of 1940 caused, among other things, serious repercussions in the drug market; and among the important medicinal materials of which a serious shortage is making itself felt not the least essential is caffeine. The usual raw material for the manufacture of caffeine is tea waste or tea shipments damaged by sea water, but in many countries a large amount of tea refuse of this kind is not available and studies have been undertaken to find other means of manufacture. In Germany, for instance, caffeine (1:3:7-trimethyl-xanthine) has been produced synthetically from uric acid via 8-methyl-xanthine, but the process is an expensive one, economic only in times of emergency. In Canada, a country where little waste tea is available, a study has been made of the production of caffeine from waste coffee and cocoa by A. Linton Davidson, Dominion Analyst of the Department of Pensions and National Health, and his observations are of much more than academic interest. The present article is adapted from his investigations, published in *Canadian Chemistry and Process Industries*, 1940, *24*, 10, pp. 493-4.

Coffee is obtainable in large quantities from South America and other parts of the New World. The total imports into Canada from these sources in 1939 were 12,142 tons and in 1938, 13,055 tons, at an average price of $170 per ton or 8½ cents per pound. This price was for coffee of all grades. It is expected that low-grade coffee or coffee waste could be imported very cheaply for the purpose of extracting caffeine. Coffee contains 1 to 1.5 per cent. of caffeine; so, on the basis of a consumption of 50 tons of caffeine per annum, something like 4500 tons of beans would be required. Of these 50 tons, an undisclosed amount accrues from the de-caffeination of coffee in the United States. Outlets for refuse, with the possible exception of fat—of which coffee beans contain about 12 per cent.—are not likely to prove a source of much revenue. Thus the price of the raw material would prove to be a dominant factor in production cost.

Caffeine occurs in the beans mainly as potassium caffeine chlorogenate, from which it can be liberated by means of alkali. Soda is said to be prejudicial to caffeine, but lime, magnesia and ammonia, in this order, are less harmful. Caffeine is notably soluble in chloroform (1:8), and so this solvent was selected for the investigation.

Continuous extraction was found to give the best results; 70 gm. of coffee in No. 20 powder, mixed with 50 c.c. of warm water and 7 c.c. of strong ammonia solution were extracted for 12 hours in a Soxhlet apparatus with 150 c.c. of chloroform. The chloroform solution, which was yellowish-green in colour, was evaporated to dryness. Then 2 gm. of paraffin wax were added and the residue digested with 60 c.c. of boiling water and allowed to cool. The object of the wax is to enable the fat to separate as a solid cake, capable of easy removal. A second digestion with 20 c.c. of boiling water followed in the same manner. The combined liquids were decolorised with 2 gm. of charcoal, concentrated to 33 c.c., from which the caffeine crystallised in silky white needles on cooling. Concentration of the mother liquor yielded a second crop of crystals. The first crop weighed 0.5 gm., the second 0.3 g.m. and the residue contained 0.1 gm. of caffeine, a total yield of 1.3 per cent. It is possible that, working continuously on a large scale, some other solvent, such as benzene or carbon tetrachloride, in which caffeine is not quite so soluble, might prove more advantageous.

Cocoa contains only a small amount of caffeine (0.15 per cent.) but from 1 to 3 per cent. of theobromine in the bean and 0.8 per cent. in the shell. To produce caffeine from cocoa it is, therefore, necessary to convert the theobromine into caffeine by methylation with methyl sulphate as expressed by the formula on the next page.

About 550 tons of cocoa refuse, consisting mostly of shell, are available in Canada per annum and should yield from 5 to 6 tons of caffeine. This material contains approximately 6 per cent. of fat.

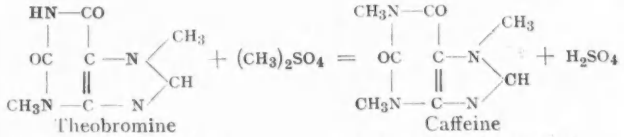
Several methods of extraction were tried, but the one giving by far the least trouble and the best results was that devised, by Mauersberger (*Chem. Z.*, LII, 1928, 89-90), a chemist at that time resident in Amsterdam. It involves extraction of a mixture of defatted cocoa and milk of lime in a vat at 50° C. with 35-40 per cent. alcohol for 1½ hours,

concentration of the filtered liquor, and precipitation of theobromine with hydrochloric acid. The process, as worked out in the Ottawa laboratories is as follows:—150 gm. of defatted cocoa waste were mixed with about 26 gm. of slaked lime and 66 c.c. of water; 750 c.c. of 40 per cent. ethyl alcohol, warmed to 60° C., were added and the mixture frequently stirred and maintained at about 50° C. for an hour and a half. The sludge was removed by filtration and washed with cold water, filtrate and washings amounting to about a litre. The combined liquors were evaporated to 75 c.c. and rendered slightly acid with hydrochloric acid. The resinous scum was skimmed off, while the crude theobromine, of a pale buff colour, was deposited and separated by filtration.

If pure theobromine is desired, the crude product may be digested with milk of lime, forming the calcium theobromine compound, the mixture warmed and filtered, the filtrate treated with charcoal, and acidified after a second filtration, when pure theobromine comes down as a white precipitate to be washed with cold water and dried.

Theobromine into Caffeine

The conversion of theobromine into caffeine presents little difficulty. Experiments proved it unnecessary to purify the crude product first. The technique proposed by Self and Rankin (*Quart. J. Pharm.*, 1931, 346) for analytical determinations of theobromine was adapted for this purpose. Ten gm. of crude theobromine were dissolved in 30 c.c. of 10 per cent. sodium hydroxide in a stoppered flask and 8 c.c. of dimethyl sulphate added. The amounts of sodium hydroxide and dimethyl sulphate used should be only very slightly in excess of the theoretical quantities. The mixture was shaken for 3 minutes and left to stand for half an hour. By that time it had become a solidified mass. A further 15 c.c. of 10 per cent. soda and 30 c.c. of water were added, so as to decompose any unchanged methyl ester, and the caffeine separated on a Buchner filter. The filtrate was extracted with chloroform three times and the chloroform distilled off. The residue, coupled with the residue on the Buchner filter, was dissolved in water, decolorised with charcoal, and caffeine crystallised out. This material was of excellent appearance. The yield of crude theobromine was 1.13 per cent., producing 1.2 per cent. of caffeine, or 98.3 per cent. conversion of theobromine to caffeine.



Theobromine (3:7-dimethyl-xanthine) Caffeine (1:3:7-trimethyl-xanthine)

Mauersberger describes the necessary plant in some detail. It is calculated that a one-ton charge of cacao shells would require a 1250-gallon extracting vessel (8 ft. diameter by 4 ft. high) fitted with a steam coil and appropriate rousing gear; two 40-chamber Premier filter presses with 36 in. plates, a 300-gallon vacuum kettle and a 120-gallon enamelware precipitating vessel, together with necessary mains and pumps. On the commercial scale it might be found expedient to use the washings from one process in the extraction of the next. The size of the presses may seem large, but it was found that 150 gm. of cocoa waste produced nearly 500 c.c. of unpressed sludge. Two 40-chamber presses forming 1 in. cakes would represent a volume of 375 gallons. It is assumed that the sludge from one ton could be compressed into this space. One ton would yield about 23 lb. of crude theobromine.

For the conversion process, possibly the enamelware vessel could be utilised for the methylation of theobromine, whilst a smaller press would be desirable for handling the caffeine and possibly also the crude theobromine. In addition a drying oven would be necessary.

Some of the many scientific instruments manufactured by the C. L. BURDICK MANUFACTURING CO., LTD., for factory and laboratory are illustrated in their recently issued Leaflet C.1.

Personal Notes

MR. B. SEEBOHM ROWNTREE, C.H., succeeds Sir John Keane, Bart., D.S.O., as chairman of the National Institute of Industrial Psychology.

MR. JOHNSON RALSTON has been appointed works manager at Dalmarnock Sewage Works, Glasgow. He has had 17 years' experience with Glasgow Corporation.

MISS HELEN TOWERS, of Larbert, who has won the diploma in metallurgy of the Royal Technical College, Glasgow, is one of several women who have taken the award in recent years.

MR. J. S. HOLLINGS has been appointed vice-chairman of Guest Keen Baldwins Iron and Steel, and Messrs. W. F. CARTWRIGHT, E. JULIAN PODE and C. R. WHEELER have been elected to the board.

SERGT.-OBSERVER K. T. HOWARTH, R.A.F., who has received the D.F.M. in recognition of "gallantry displayed in flying operations against the enemy," is on the staff of Hartleys' Chemists, Ltd., Colne, Lancashire.

LIEUT. JOHN MACMILLAN STEVENSON PATTON, Royal Canadian Engineers, has been awarded the George Cross "for most conspicuous gallantry in carrying out hazardous work in a very brave manner." The hazardous work consisted in the safe disposal of an unexploded bomb, and Mr. Patton, who is a chemical engineer, is now adding the study of the technique of dealing with such bombs to the more usual practices of his profession.

PROFESSOR ETIENNE AUDIBERT of France has been awarded the Melchett Medal for 1940. This announcement was made at a meeting of the Institute of Fuel on December 12, where it was further stated that, as it was not now possible to get into touch wih Professor Audibert, the medal would be kept in safe custody until the presentation could be made. MR. L. H. F. NICHOLS, of the Research Staff of the British Coal Utilisation Research Association, was awarded the Students' Medal (accompanied by a prize of books) on the same occasion, for his paper entitled "Gas Sampling and Temperature Measurement in the Fuel Bed." MR. H. BUCKLEY, of the Paterson Engineering Co., was awarded a special prize of books for a paper adjudged very well worthy of a second award.

OBITUARY

PROFESSOR HENRY JOHN SPOONER, who died in London last Monday, aged 84, had been head of the School of Engineering at the Regent Street Polytechnic for 40 years. His interests lay principally in the departments of Civil and Mechanical Engineering, but his work on the preparation of peat for fuel was of particular importance to chemical engineers.

MR. CHARLES ADOLPHUS HACKMAN, F.I.C., who died on December 12 at Radlett, Herts., aged 64, was a well-known figure in the world of analytical chemistry. He was Public Analyst to the boroughs of Battersea and Colchester, and additional Public Analyst to Wandsworth; and with his partner, Mr. L. H. Mitcham Milcar, fulfilled the same function for the National Health Insurance Committee, in testing the drugs supplied to insured persons. Mr. Hackman was elected A.I.C. in 1899 and F.I.C. in 1902.

The Hilger Cabinet Spark Generator has been designed for greater convenience in spectrochemical analysis and is mounted on castors so that it can be wheeled to any desired location. It is fully described in a leaflet just issued by ADAM HILGER, LTD., 98 St. Pancras Way, London, N.W.1. Another of their leaflets describes the Graphical Analytical Calculator, for the rapid routine inspection of spectrograms obtained in quantitative spectrochemical analysis.

NOTES FROM WORKS SAFETY JOTTINGS

War-Time Personnel : Advice about Flooring

by JOHN CREEVEY

THE difference between skilled and unskilled workers is to some extent a matter of opinion. But with regard to accidents it is not to be laid down that always the unskilled will suffer while the skilled remain immune; neither must it be said that responsibility for accidents is attributable to the unskilled worker more often than to the skilled worker. The course of events depends upon the general measures of safety to which both groups have been educated, but even then it does not follow that the negligent one takes all the consequences. Accidents have a peculiar way of sometimes hurting the man who deserves to be hurt by his negligence, and sometimes leaving him free of the slightest scratch while fury is showered upon some innocent and careful fellow-worker, who happens to be on the spot where the danger is lurking. That makes it all the more important that general measures of safety should be framed to cover the whole of the works personnel, and that such measures should be regarded by all as a matter for the good of all, each making his or her own contribution in being conscientious and regardful of the safety of the others.

* * *

The entry into industry of so many additional workers during war time makes it doubly needful that safety matters be kept well in the light and that every available means be pressed into service to drive home the importance of freedom from accidents. True it is that the chemical industry is not affected to the same extent as the engineering industries, where so many workers new to the job have been absorbed after preliminary training in some special aspect of engineering. The necessary expansion of the chemical industry, like that of the engineering industries, has also called for an additional number of workers, but in most cases they have been drawn from among those with chemical education, though not necessarily with works experience. In the chemical works we now find the ex-teacher of chemistry, the man who sold chemicals, the man who studied chemistry and then took up the journalistic or book-writing aspect of it. It still follows that their safety in the new sphere of work must not be ignored any more than that of the clerk who has passed into the engineering shops as a lathe operator after preliminary training under the Government scheme.

* * *

For protection against personal injuries in the heavy chemical industry there are two items of equipment which should never be ignored. Where falls are a hazard, a man can work better and more safely if he has a safety belt. But such a belt must be designed on modern lines with all cumbersome bulk avoided; it must be light and flexible, so that it permits good freedom in working. Added to this, it must offer a tested strength which is many times greater than requisite for normal service, not only from the aspect of tensile strength and resistance against wear, but also in the chemical quality of the materials of which such a belt is made: in the leather, linen web, or rope, as well as in the twine and thread needed. The second item, which is not used so much in this country as it is in the United States, is the skull-guard—a light-weight protective hat made of laminated bakelite with a high degree of fracture resistance as well as resistance to the action of oil and common chemicals. In the United States seven or eight distinct types are made to serve different process-industry requirements. Head injuries, like broken bones from falls, are not to be disregarded where speed of working is now so essential and any lost time must be avoided as much as the matter of compensation expense.

* * *

The provision of a non-slipping floor surface is not always considered as thoroughly as it deserves, when works extensions are in progress. Truly it is admitted that certain chemicals will favour slippery conditions if due care is not exercised in handling them and there is spillage, but that is not the hazard which is in mind. Mere movement over floors, especially by wheeled trucks, or by the heavy boots of workers, will have a tendency to make some floors extremely slippery; there is not only the danger of the individual slipping without warning and with consequent injuries, but also the possibility of a heavily-laden truck getting out of control by a sudden skid, with even graver consequences. Just what constitutes the most desirable floor surface for a particular situation where chemicals are handled depends upon the particular case; there may be much wear and tear to be avoided, or resistance to corrosive action as the outstanding feature may be demanded. In greater detail, the constant wheeling of heavy trucks will be different in ultimate effect from the constant rolling, slewing, and up-turning of steel drums. Floor safety against slipperiness is good in the case of wood block, wood plank, concrete, cement with hardened surface, asphalt and asphalt block, and brick; it varies in the case of steel plates and gratings, and stone block and tile. There are many other aspects which have to be considered, such as initial cost, ease and cost of repair, ease of cleaning, ease of trucking, resistance to trucking and general abrasion; resistance to the action of water, oil, acids, alkalies, and organic liquids distinct from oils; general cleanliness, general quietness, warmth and ease to the feet, resistance to heat and to fire. The repair, *e.g.*, of a wood plank floor is economical but troublesome as compared with that of a wood block floor; the resistance to trucking is very good in the case of steel plates, but skidding of trucks is easy and may be difficult to avoid.

* * *

Floors that fail in safety requirements have to be provided with a new surface, sooner or later. Floors that wear readily have to be repaired, sometimes with consequent increase of hazard, as where worn wood floors have been patched with sheet metal and there is possibility of both slipping and stumbling. The U.S. National Safety Council makes five requirements for a safe and satisfactory floor. It should be smooth and free from nails, bolts and other projections, and from holes and splinters. It should be dry, low in heat conductivity, durable and easily cleaned. Floor and foundations should be strong enough to bear at least four times the standing load and six times the moving load. It should be as nearly noiseless as possible, for though a floor may wear well, the noise of feet, trucks, and machinery upon it may have an irritating effect on the worker. It should not be slippery or made of material which will become slippery in use. To these five requirements might well be added the advice that no two adjoining types of floor should be of different height, for this invariably results in trouble from the broken edge of one of the materials.

* * *

The high-speed ventilation of a contaminated atmosphere has become desirable on more than a few occasions. Direct ventilation by such ready means as may be available will not always suffice. If a contaminated atmosphere, with its consequent dangers, is a possibility, there is already in existence a portable device—without moving parts of any kind—which will give long service in the matter of removing such an atmosphere as often as becomes necessary. This air-mover is operated by the passage of a small amount of compressed air, which by Venturi effect will exhaust or deliver great volumes through the bell.

Benzyl Cellulose Manufacture

Acceleration by Catalytic Agents

IN earlier processes for the benzylation of cellulose by treatment of soda cellulose with a mixture of benzyl chloride and dibenzyl ether, the formation of a product exhibiting uniform solubility in organic solvents depended upon the use of a very large excess of the benzylating agent. This in turn resulted in considerable by-product formation (a mixture of benzyl alcohol and dibenzyl ether to which the name of "benzyl oil" was given) which introduced further difficulties into the purification of the cellulose ether. Addition of the alkylating agent in instalments over a long period rendered the process uneconomic. In recent years a number of catalysts have been discovered which enable benzylation to proceed rapidly in presence of a relatively small proportion of the benzylating agent and to yield a product exhibiting uniform solubility.

Examples of suitable catalytic agents are compounds of cobalt and pentavalent arsenic (B.P. 518,197; I.G.) and boron compounds (U.S.P. 2,205,487; Hercules Powder Company) Formation of a benzyl cellulose completely soluble in a 9:1 mixture of toluol:butyl alcohol with the aid of an arsenic compound as catalyst is illustrated in the following example.

A solution of 0.2 to 0.6 part arsenic acid in 5 to 10 c.c. 40 per cent. caustic soda was kneaded with the soda cellulose prepared by working one part cellulose with 2.5 parts caustic soda (in the form of a 30 to 50 per cent. solution) for several hours. Three parts benzyl chloride and three parts dibenzyl ether were added to the soda cellulose containing the dissolved catalyst and the mixture heated for 3 to 5 hours at 110 to 120° C. With the addition of a further one part benzyl chloride and 0.4 part powdered caustic soda, heating was continued for a further 8 to 12 hours, when a product with the desired solubility characteristics was obtained.

Other examples show the application of cobalt nitrate (0.025 to 0.05 part to one part cellulose) and boric acid (0.4 part to one part cellulose).

Food Chemist Disappears

Gestapo Action Suggested

THERE appears to be a possibility that Germany's need for *ersatz* food has led to the kidnapping of a chemist in America. Dr. Erhard Fernholz, a German chemist who left his native country for the United States five years ago, is reported by a *Daily Telegraph* correspondent to have disappeared on Tuesday from his home at Princeton, N.J. He walked out last Saturday morning with a couple of dogs, who returned within an hour, and has not been seen since. As Dr. Fernholz is head of the chemistry division of the Squibb Institute for Medical Research and one of the co-discoverers of vitamins E and K, the suggestion has been made that he may have been "persuaded" by Gestapo agents to return to Germany to continue his researches.

Chemical Matters in Parliament

Tar Oils as Motor Fuel

IN reply to a question raised by Mr. D. Adams in the House of Commons on Tuesday, Mr. Geoffrey Lloyd, Secretary for Petroleum, stated that a scheme had been drawn up to encourage the use of tar oils as motor fuel in goods and public service vehicles, and at the same time to effect economy in the use of imported fuel. The scheme would come into force on January 24, and would be subject to review at the end of six months.

The reviewer of THE ADVANCE OF THE FUNGI, by E. C. Large (Jonathan Cape, 18s.), wishes to apologise for an error of fact contained in his notice of the volume in last week's issue of THE CHEMICAL AGE. It was stated that the number of pages in the book was 48; this should have read 488.

Research on Fats

Work at Liverpool University

COMMENT in the Annual Report of Liverpool University notes that the Industrial Chemistry Department had not been called upon to undertake work of urgency on fats to the extent that had been considered possible. Nevertheless, a number of minor problems concerning fats had been dealt with, and more than one scheme of research now in progress was directed towards a subject of potential national utility in this field. It is hoped to retain for as long as possible the services of a very few men who are already trained investigators of this subject. The Lever Research Studentship has been held by Mr. L. Maddison, and Mr. H. Plimmer has continued research on behalf of the Dyestuffs Group of Imperial Chemical Industries, Ltd. The work on animal fats carried out by Dr. W. H. Pedelty for the Food Investigation Board was completed in September. The department has been proud to receive as a research worker a prominent continental authority on fats, Dr. H. Schönfeld, whose editorship of a new edition of a standard work "Chemie und Technologie der Fette und Fettprodukte" was interrupted by political conditions abroad; he is working with the University on behalf of Manchester Oil Refinery, Ltd.

Chemical and Allied Stocks and Shares

AIDED by the war news, sentiment on the Stock Exchange has improved, and on balance the majority of movements in security values have been in favour of holders. Nevertheless, year-end influences tended to prevent improvement in the volume of business, and markets were unaffected by the War Damage Bill, the terms of which were in accordance with general expectations.

Only small movements were shown in Imperial Chemical, which at 28s. 6d. were virtually the same as a week ago, while, although "ex" the half-yearly dividend, the preference units were slightly higher at 31s. 9d. B. Laporte were quoted at 51s. 3d., but were inactive, and business in Cooper McDougall and Robertson took place around 20s. Dunlop Rubber were little changed at 31s. 6d., but Turner and Newall further reacted to 63s. 9d. British Oxygen were 63s. 1½d., and British Aluminium 40s. 6d., but Nairn and Greenwich at 47s. 6d. were again better, awaiting the impending results. Lever and Unilever were little changed at 23s. 6d. Incidentally, Lever and Unilever N.V. and also International Nickel are among the dollar and other shares in which permission to resume dealings between United Kingdom residents has been granted.

Associated Cement at 58s. 9d. were little changed on balance, and British Plaster Board were again 12s., but Wall Paper Manufacturers deferred units improved from 20s. 3d. to 21s. Distillers ordinary units were firm at the higher price of 64s. 9d., aided by the maintenance of the interim dividend, while United Molasses units had a firm appearance at 22s. 9d. Business in British Industrial Plastics took place at 2s. 4½d., while Morgan Crucible 5½ per cent. first preference changed hands at 21s. 3d. and Greeff-Chemicals Holdings 5s. units were quoted at 6s. W. J. Bush 5 per cent. £5 preference shares transferred at 90s. at one time. Elsewhere, Blythe Colour 4s. shares changed hands at 6s. 4½d., while I.C.I. (Salt) 4½ per cent. debentures were quoted at 97½xd. Valor ordinary shares showed business at the better price of 24s. 6d., and Ilford ordinary continued to be quoted at this figure, aided by the good impression created by the recently-issued results.

Movements in textile securities were again small, but Courtaulds were firmer, and British Celanese were rather more active on annual meeting considerations. In the iron and steel section sentiment continued to be governed mainly by the factor of rising production costs, although the disposition in the market is to take the view that in most cases dividends may be little changed. Dorman Long were easier at 17s. 3d., but Staveley shares were slightly better at 43s., and Stewarts and Lloyds were steady at 40s. 9d. Tube Investments, however, were 7½d. down at 88s. 1½d., although United Steel became firmer at 21s. 6d.

Among other securities Borax Consolidated deferred eased to 25s. 7½d. Boots Drug at 27s. regained part of their recent decline, but Sangers reacted further to 18s. 6d., and Timothy Whites were 19s. 9d. British Drug Houses continued to be quoted at 21s. 3d., and General Refractories were again 7s. 6d. Beechams Pills 2s. 6d. deferred shares were steady at 8s. 4½d., awaiting the interim dividend announcements of leading subsidiary companies. Triplex Glass 10s. ordinary units transferred around 18s., but United Glass Bottle and other shares of glass companies were inactive. There has been a fairly general marking-up of prices of oil shares under the lead of Anglo-Iranian and Burmah Oil, sentiment in regard to which has been assisted by the war news.

General News——
——From Week to Week

THE NEW TELEPHONE NUMBER of W. C. Holmes & Co., Ltd., of Huddersfield, is Huddersfield 5281 (4 lines).

OWING TO ENEMY ACTION, the Lac Research Laboratory of the London Shellac Research Bureau has been obliged to close its London quarters, but it will re-open, thanks to the kind offices of Principal D. Cameron Smail, Heriot-Watt College, at the School of Mines, Grassmarket, Edinburgh, on January 2 next.

THE NEW ADDRESS of Messrs. Scott Bader and Co., Ltd. (which now incorporates Messrs. W. A. Mitchell and Smith, Ltd.), is Wollaston, Northants. (Tel.: Wollaston 262; Cables: Scottbader, Wollaston, Northants). A service staff is still maintained at 109 Kingsway, W.C.2, to deal with urgent London inquiries.

THE GOODWILL, PATENTS, trade mark "Koppers," and other similar assets of the Koppers Coke Oven Co., Ltd., of Sheffield, have been taken over from the Receiver of that company by the Woodall-Duckham Vertical Retort and Oven Construction Co. (1920), Ltd., who are now in a position to deal with inquiries for plant and apparatus formerly supplied in this country by the Koppers Coke Oven Co.

RECENTLY ACKNOWLEDGED DONATIONS to the Royal Air Force Benevolent Fund include the following: George Cohen, Sons and Co., Ltd., £525; Imperial Chemical Industries, Ltd., £100; balance of St. Austell and District "Spitfire" Fund (towards which the china clay district of S.W. England subscribed over £6000 and those interested in the china clay business in New York contributed £300), £100.

MR. THOMAS MCLACHLAN, F.I.C., wishes to thank his numerous friends and clients who have expressed their sympathy at the repeated effects of enemy action on his Laboratory, and asks them to excuse a personal letter in the circumstances. He has been glad to avail himself of the hospitality of the Pharmaceutical Society and will be grateful if correspondence and samples are sent to him for the present c/o The Pharmaceutical Society of Great Britain, 17 Bloomsbury Square, W.C.1. (Tel.: HOLborn 8967).

THE ACTION OF AN EMPLOYEE of Messrs. Lochore and Ferguson (L. and S.), Ltd., sugar millers of Greenock, in distributing to some children playing in the street near the company's premises, a quantity of a white substance that might be mistaken by children for sugar, but was, in fact, caustic soda, resulted in John Porteous, aged 6, receiving a severe burn on the cheek, with permanent disfigurement. James Porteous, father of the child, who sued the company for £500, was awarded £175 damages in Greenock Sheriff Court, by way of reparation for the injury to his son.

Foreign News

MR. MACKENZIE KING, Prime Minister of Canada, has made a statement that the export of nickel from Canada has been under extremely close control. He added that export permits were granted only when it was clear there was no danger of the metal reaching a hostile country either directly or indirectly.

OWING TO THE DIFFICULTY of obtaining copper sulphate from abroad, the Hungarian Ministry of Agriculture has decided to control and reserve stores of this chemical, which will now not be obtainable except for disinfestation of vines. Farmers, however, will be able to buy mercurial corrosives at controlled prices, for protecting other crops.

VICTOR CHEMICAL WORKS, of Chicago, have incorporated an interesting idea into one of their recent advertisements. In addition to established products, they list "chemicals recently developed" and produced only in the laboratory (*e.g.*, phosphorus thioanilide). An invitation is extended to clients to write for a description of the properties of these chemicals, with the hope that one of them may solve a knotty problem.

A NEW PLANT for the production of high grade pig iron and ferro-vanadium is to work on the titanium and magnetite ores at Pudozhgora, Karelia (U.S.S.R.), the reserves of which are estimated at 35 million tons. In addition to their vanadium content the ores are marked by their purity and the almost complete absence of sulphur and phosphorus. Building will start early in 1941. In many places the ore lies near the surface, and it is estimated that open-cut mining can be carried on for some sixteen years.

British Chemical Prices

Market Reports

STEADY price conditions characterise nearly all sections of the general chemical market, and in some instances a firmer tendency is noted. Most of the leading buyers are now occupied with their requirements for the first half of next year and a fair amount of contract renewal business is in circulation. Holders of stocks, however, are not disposed to enter into long-term commitments and bookings are generally short dated. There is a fair inquiry for ammonium carbonate, borax, and the heavy acids, and amongst the potash products permanganate is moving well and both bichromate and yellow prussiate are strong markets. Sodium acetate, sodium nitrate and sodium sulphide are all firm in quotation and a steady trade is reported for the lead oxides, quotations for which remain unchanged. In the market for coal tar products a steady inquiry is reported and trade in the aggregate is certainly not less than during recent weeks. Pyridine is perhaps not quite so firm, but xylol and solvent naphtha are in good request at slightly advanced values.

MANCHESTER.—With the approach of the year-end interest is growing in possible price developments in the chemical trade and the feeling on the Manchester market during the past week was that advances will probably be seen in a number of directions. The demand for contract supplies from users in this area, including the cotton and woollen textile and allied trades, continues on a fairly brisk scale. In the tar products section pyridine has further eased to a slight extent, but in other directions values are mostly well held, with a fair amount of business offering.

GLASGOW.—Business during the past week, both in home and export trade, still remains rather quiet, with prices firm. Great difficulty is being experienced in securing supplies of many materials from the South for prompt delivery owing to delay on the railway. There is a considerable uncertainty about the placing of contracts over 1941, and a general rise in prices is expected when renewals take place. Starches and dextrines will be controlled from January 6, and will be available only by permit and when purchased from authorised distributors.

Price Changes

Ammonium Carbonate.—£39 to £40 per ton d/d in 5 cwt. casks.
Antimony Sulphide.—Golden, 9½d. to 1s. 8d. per lb. Crimson, 1s. 8d. to 2s. per lb.
Arsenic.—99/100%, about £31 10s. per ton, ex store.
Cadmium Sulphide.—5s. 6d. to 6s. per lb.
Calcium Acetate.—MANCHESTER: Brown, £21 per ton.
Carbon Black.—5d. to 9½d. per lb., according to packing.
Creosote.—MANCHESTER: 4¾d. to 7d. per gal.
Cresylic Acid.—Pale, 99/100%, 2s. 2d. per gal.
India-rubber Substitutes.—White, 5¾d. to 8½d. per lb.; dark, 5 1/16d. to 6d. per lb.
Lead Acetate.—MANCHESTER: £46 to £48 per ton.
Naphtha.—Solvent, 90/160°, 2s. 1d. to 2s. 4d. per gal.; Heavy, 90/190°, 1s. 7d. to 1s. 8d. naked at works. MANCHESTER: 90/160°, 2s. 2d. to 2s. 4d. per gal.
Potassium Permanganate.—B.P. 1s. 5½d. per lb. for 1-cwt. lots; commercial, £7 9s. 6d. to £8 1s. 6d. per cwt., according to quantity d/d.
Pyridine.—90/140°, 16s. 6d. per gal.; 90/160°, 14s.; 90/180°, 4s. to 5s. per gal., f.o.b. MANCHESTER: 13s. 6d. to 17s. per gal.
Sodium Phosphate.—Di-sodium, £19 to £22 per ton, d/d, for ton lots. Tri-sodium, £25 to £27 per ton d/d for ton lots.
Sodium Prussiate.—From 7d. per lb. ex store.
Sodium Sulphate (Salt Cake).—Unground, spot, £45 per ton d/d station in bulk.
Sodium Sulphide.—Solid, 60/62%, Spot, £15 5s. per ton d/d in drums, crystals, 30/32%, £10 12s. 6d. per ton d/d. in casks. MANCHESTER: 60/62%, £15 12s. 6d.; 30/32%, £10 10s.
Turpentine.—65s. per cwt., spot, American, including tax, ex wharf, in barrels, and ex discount.
Vegetable Lamp Black.—42s. per cwt., d/d.
Xylol.—Commercial, 3s 1d. per gal.; pure, 3s. 5d.

HOMICIDE IN CHEMICAL WORKS

Sentence of one year's imprisonment was imposed by Lord Mackay in the High Court of Justiciary, Glasgow, on December 10, on John Ewing (24), who was found guilty of culpable homicide by recklessly administering noxious substances to two fellow-employees in the Shawfield Chemical Works, Glasgow Road, Rutherglen, as a result of which they became ill, and one died. It was alleged that Ewing persuaded William Shields (27) and John Nicholl (23) to drink a quantity of poisonous solution containing chromate of soda, bichromate of soda and sulphate of soda, from a bottle which he pretended contained whisky or wine. Shields died the next day. Ewing pleaded that it was his intention to have a joke against Shields, who was "very serious and susceptible to leg-pulling." He thought Shields realised it was a joke and he also thought Nicholl only pretended to drink the solution.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

TIMOTHY WHITES AND TAYLORS, LTD., London, S.W., drug and hardware stores. (M., 21/12/40.) November 25, two substituted securities supplemental to Trust Deed dated February 15, 1940, and Trust Deed dated September 6, 1935; charged on 57 Spring Gardens, Buxton, and 7 High Street, Grantham, respectively. *£1,500,000. June 6, 1940.

XELEX PRODUCTS, LTD., London, W., manufacturers of raw plastic material. (M., 21/12/40.) November 21, £125 debentures, part of a series already registered.

Satisfactions

SILVER SPRINGS BLEACHING AND DYEING CO., LTD., Congleton. (M.S., 21/12/40.) Satisfactions November 27, of two mortgages and further charge, registered March 14, 1923, mortgage registered October 3, 1923, and further charge registered November 19, 1930.

Companies Winding-Up Voluntarily

THURROCK CHEMICAL COMPANY, LTD. (C.W.U.V., 21/12/40.) That the Company be wound up voluntarily. Robert Pearson Winter, of 16, Market Street, Newcastle-upon-Tyne, appointed liquidator.

Receiverships

J. W. CLARK (CHEMISTS), LTD., 198 Trinity Road, S.W.17. (R., 21/12/40.) C. L. H. Martin, Corporate Accountant, of New House, Hatton Garden, E.C.1, was appointed receiver and manager on November 19, under powers contained in debenture dated May 15, 1939.

Meeting of Creditors

R. G. HARBOTT AND CO., LTD., Victoria Works, Romford Road, E.7. Manufacturing chemists. (M.C., 21/12/40.) Receiving Order, November 4. First meeting, December 12, Board of Trade Offices, Carey Street, W.C.2.

Company News

Anti-Attrition Metal, Ltd., have declared a final dividend of 8¾ per cent., making 12½ per cent. (15 per cent.).

The Kern Oil Co., Ltd., which is maintaining a dividend of 8 per cent., announces a net profit of £89,099 (last year £84,617).

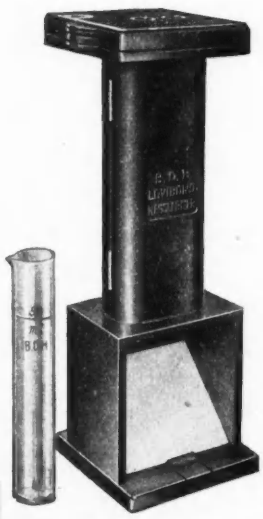
Associated Manganese Mines of South Africa, Ltd., have declared a final dividend of 7½ per cent., making a total of 12½ per cent., less tax (10 per cent.).

English Clays, Lovering Pochin and Co., Ltd., report a profit of £96,711, compared with £104,117 in the previous year. Dividend of 1½ per cent., less tax, is recommended on the ordinary shares (last year 2½ per cent.).

New Companies Registered

Hilderson Glebe Coal Co., Ltd. Private company. Capital, £1500 in £1 shares. Colliery and mine proprietors, mining engineers, metallurgists, gas manufacturers and suppliers, etc. Subscribers: George Miller, 7 Newlands Park, Glasgow; James Young. File No. 24,587; registered in Scotland.

Curzon Manufacturing Co., Ltd. (364,342).—Private company. Capital £100 in 100 shares of £1 each. Manufacturers, exporters and importers of and wholesale and retail dealers in oils, ores, chemicals, paints, lacquers, varnishes, wood, rubber, metals, etc. Subscribers: Hector L. Macneal, 46 Lyndale Avenue, N.W.2; Arthur Cross.



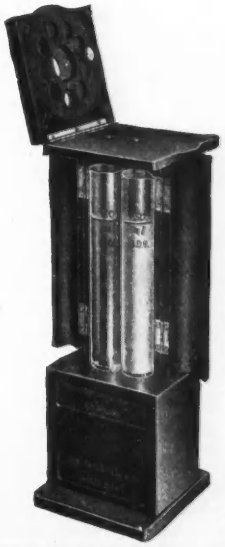
The B.D.H. Lovibond Nessleriser, with one disc (at choice) and accessories, £6-10-0. Extra discs (with nine colours) £1-10-0.
Plus 10 per cent. advance as from June 1st, 1940.

The *usefulness* of the Nessleriser

The B.D.H. Lovibond Nessleriser combines the accuracy and convenience of colorimetric methods of analysis with the advantages of permanent colour standards and particular ease of manipulation.

The time saved from preparation of standards for each test makes the Nessleriser an especially valuable addition to the equipment of the busy industrial laboratory.

Over 30 discs, each incorporating nine standard colours, are available for the determination of various radicles. A set of pamphlets describing the application of the Nessleriser in various tests will be supplied free of charge. A Price List of the various reagents and indicators used in conjunction with the Nessleriser is also provided.



THE BRITISH DRUG HOUSES LTD.
GRAHAM STREET LONDON N.1

BRITISH ASSOCIATION OF CHEMISTS

Unemployment Insurance. Over £12,500 paid out.
Legal Aid. Income Tax Advice. Appointments Service
Write for particulars to :—

C. B. WOODLEY,
C.R.A., F.C.I.S.
General Secretary, B.A.C.

"EMPIRE HOUSE,"
175, PICCADILLY,
LONDON, W.1

'Phone : Regent 6611

CLASSIFIED SECTION

NOTE: Trade announcements, other than strictly second-hand and job lines, cannot be inserted in these pages except by firms whose advertisements run in the display columns

EDUCATIONAL

Great Possibilities for
QUALIFIED CHEMICAL ENGINEERS
Key Men in Wartime and Afterwards.

Many of the finest posts in Britain in Wartime are reserved for Chemical Engineers. The same will be the case when the war is over. The vast technique and experience now being applied to Chemical Technology for war purposes will then be suitably utilised in reconstruction, and in trade and commerce.

Enrol with the T.I.G.B. for the A.M.I.Chem.E. Examinations in which home-study Students of The T.I.G.B. in the last two successive years have gained :—

TWO FIRST PLACES. TWO "MACNAB" PRIZES.

Write to-day for "The Engineer's Guide to Success"—free, containing the world's widest choice of Engineering Courses—over 200—the Department of Chemical Technology including Chemical Engineering Processes, Plant Construction, Works Design and Operation, and Organisation and Management—and which alone gives the Regulations for A.M.I.Chem.E., A.M.I.Mech.E., A.M.I.E.E. C. & G. B.Sc., etc.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN,
219, Temple Bar House, London, E.C.4.

FOR SALE

600

TRIPLE EFFECT EVAPORATOR
FOR
IMMEDIATE DISPOSAL.

We can offer the following very fine Evaporator for quick sale at most attractive price :—

TRIPLE Effect Evaporator by McNeil, with brass tubed calandrias each containing 380 tubes 3 ft. 6 in. long, 16 W.G. giving total heating surface of 1480 square feet. The tubes are 1¾ in. dia. expanded into brass tube plates 7 ft. 0 in. dia. by 1 in. thickness. The vapour portions are 7 ft. 0 in. dia. by 5 ft. 8 in. high, each arranged manholes and 3 sight windows 9 in. by 4 in. with bronze fittings. Bolted on domed covers arranged 1 ft. 4 in. vapour outlets.

The Evaporator is complete with Jet Condenser, inter-connecting pipes, fittings, etc.

Further details from :—
GEORGE COHEN
Sons & Co., Ltd.,
STANNINGLEY, LEEDS.

LIMITATION of supplies (Miscellaneous) order very large quantity of surplus quota Class 16 for sale. Replies to Box 1999, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

CHARCOAL, ANIMAL, and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone : 3285 East.

100 REBUILT Hydro Extractors by all leading makers from 18 in. upwards with countershafts attached and safety covers. Jacketed Steam Pans, various sizes. List on request. Seen at Randalls, Arundel Terrace, Barnes. Telephone : Riverside 2436.

50,000 FEET brand new Balata and Rubber Belting, all popular sizes. Every belt guaranteed and sent on approval at bargain prices. Write for stock and price lists, F. Taylor & Sons (Manchester), Ltd., Barr Hill Works, Salford, 6, Lancs.

COMBINED AUTOMATIC WEIGHING, MEASURING and Mixing Plant, with six weighers, capacity about one ton per hour, with 20 h.p. and 7½ h.p. motors, elevator, conveyor, vibro-screen, etc. Can be seen erected in Kent. THOMPSON AND SON (MILLWALL), LTD., Cuba Street, Millwall, London, E.14. East 1844.

'Phone 98 Staines.

DEHNE PRESS, 24 Chambers, 25 in. square; C.I. Jacketed Vacuum Pan, 3 ft. 6 in. dia. by 5 ft. 3 in. deep; Copper Jacketed Vacuum Pan, 25 gallons; Tubular Condenser, 7 ft. by 20 in. by Royles; Sissons Jacketed Dough Mixer, 24 in. by 18 in. by 16 in.; Milk Cooler Capillory, type 7 ft. by 5 ft.

HARRY H. GARDAM AND CO., LTD., STAINES.

WINKWORTH FOR MACHINERY, Mixing, Grinding and Refining. Inquiries invited. Catalogue on request. 65 High Street, STAINES. Telephone 1010.

1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each. Clearing at 30s. dozen. Also Large Quantity Filter Cloths, cheap. WILSONS, Springfield Mills, Preston, Lancs. Phone 2198.

WANTED

"LIMOSO" Class 16 advertiser is open to buy surplus quota for cash. Offers in confidence to Box 2000, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

A FEW copies of the Index to Volume 42, January-June, 1940. Reply to THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

SERVICING

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams : "Hill-Jones, Bochurch, London." Telephone : 3285 East.

AUCTIONEERS, VALUERS, ETC.

EDWARD RUSHTON, SON AND KENYON (Established 1855).
Auctioneers' Valuers and Fire Loss Assessors of
CHEMICAL WORKS, PLANT AND MACHINERY
York House, 12 York Street, Manchester.
Telephone : 1937 (2 lines) Central, Manchester.
Telegrams : "Russoken," Manchester.